# I. Introduction and Executive Summary

This report describes sound levels associated with operations at the proposed PacifiClean Organics Processing Facility in Cle Elum, Washington, located on Thorp Prairie Road east of Cle Elum. This report presents existing noise levels measured in August and September of 2012 in the vicinity of the site, noise emission characteristics of the equipment proposed for the site, predicted sound levels, and recommended noise mitigation measures for on-site materials processing, maintenance, and equipment activities.

The Elk Heights facility will process yard debris, commercial and residential food waste and municipal biosolids, a majority of which are generated in King and Snohomish Counties. Biosolids from the City of Ellensburg and other local municipalities will also be composted at the Elk Heights facility. The majority of finished compost will be utilized as an agricultural soil amendment in central Washington, with the balance used in residential and municipal applications.

Initially, the Elk Heights facility will be sized to process 160,000 tons of organic waste per year and to yield approximately 90,000 tons of finished compost. Within two years, the project goal is to expand the facility to accommodate a maximum of 320,000 tons of waste per year and produce approximately 180,000 tons of finished compost. Another 10,000 tons of feedstock will be processed by anaerobic digestion.

The predicted noise levels at the property lines and nearest receiving residential sites show compliance with noise code limitations and no impact on existing environmental noise levels at all existing residences, with the recommendations outlined in this report implemented.

All recommendations have been determined to meet the most restrictive code limits on site as mandated by the Washington Administrative Code section 173-60-040.

# II. Project Site

A vicinity map showing the proposed PacifiClean site, surrounding properties and sound measurement and prediction locations are shown in Figure 1. A proposed site plan is shown in Figure 2.

The site is located east of Thorp Prairie Road and west of the Yakima River, and is noted by the rectangular red box in Figure 1. The additional property shown in Figure 1 was purchased by PacifiClean as a buffer. Surrounding these buffer parcels is Interstate 90 to the west, undeveloped land to the south, farmland to the east and undeveloped light residential to the north. The nearest existing residence is located to the northwest, and the closest property line to the facility operations is to the south.

Figure 1 shows the locations of the nearest residences in addition to the limits of the PacifiClean property.

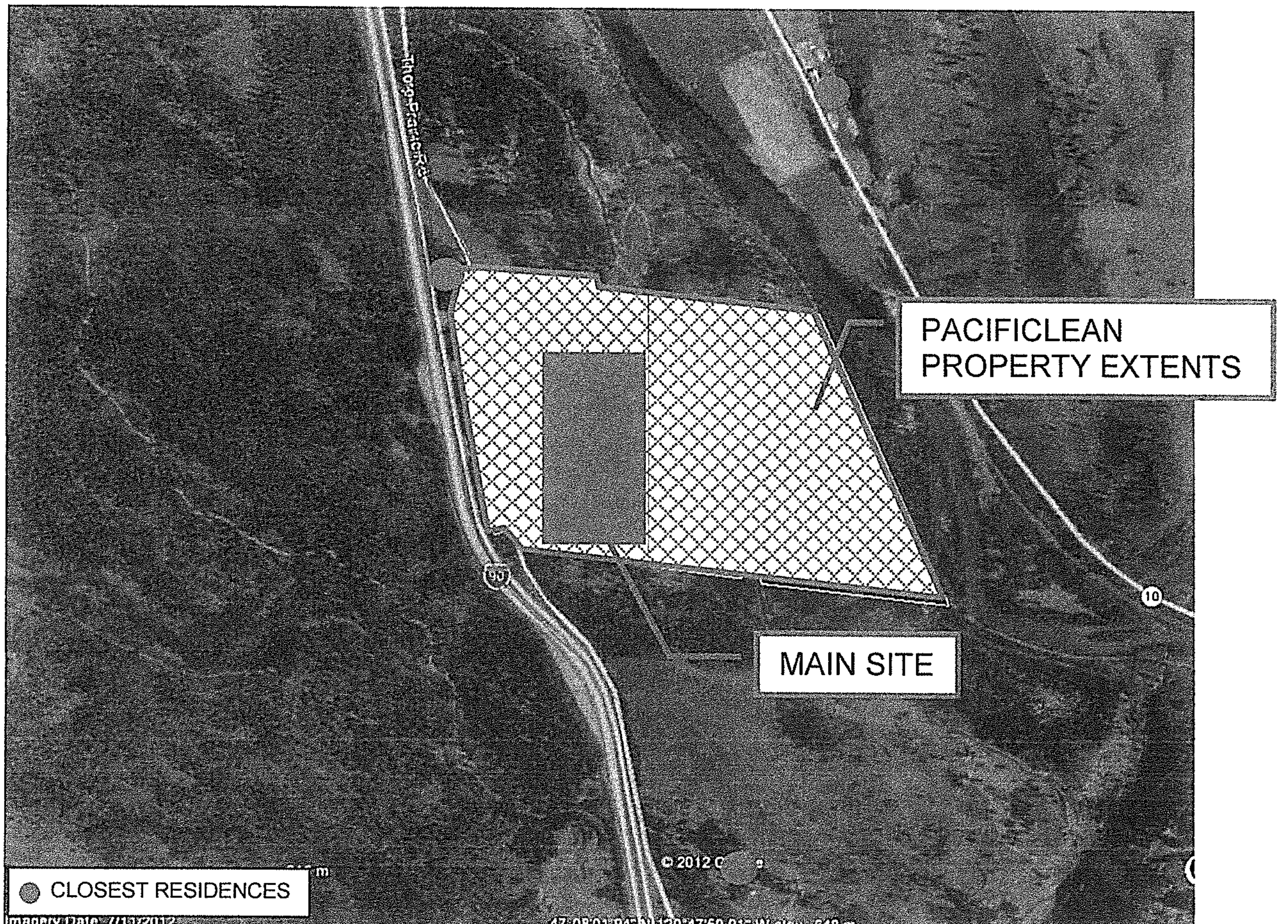


**Figure 1 - PacifiClean Site**

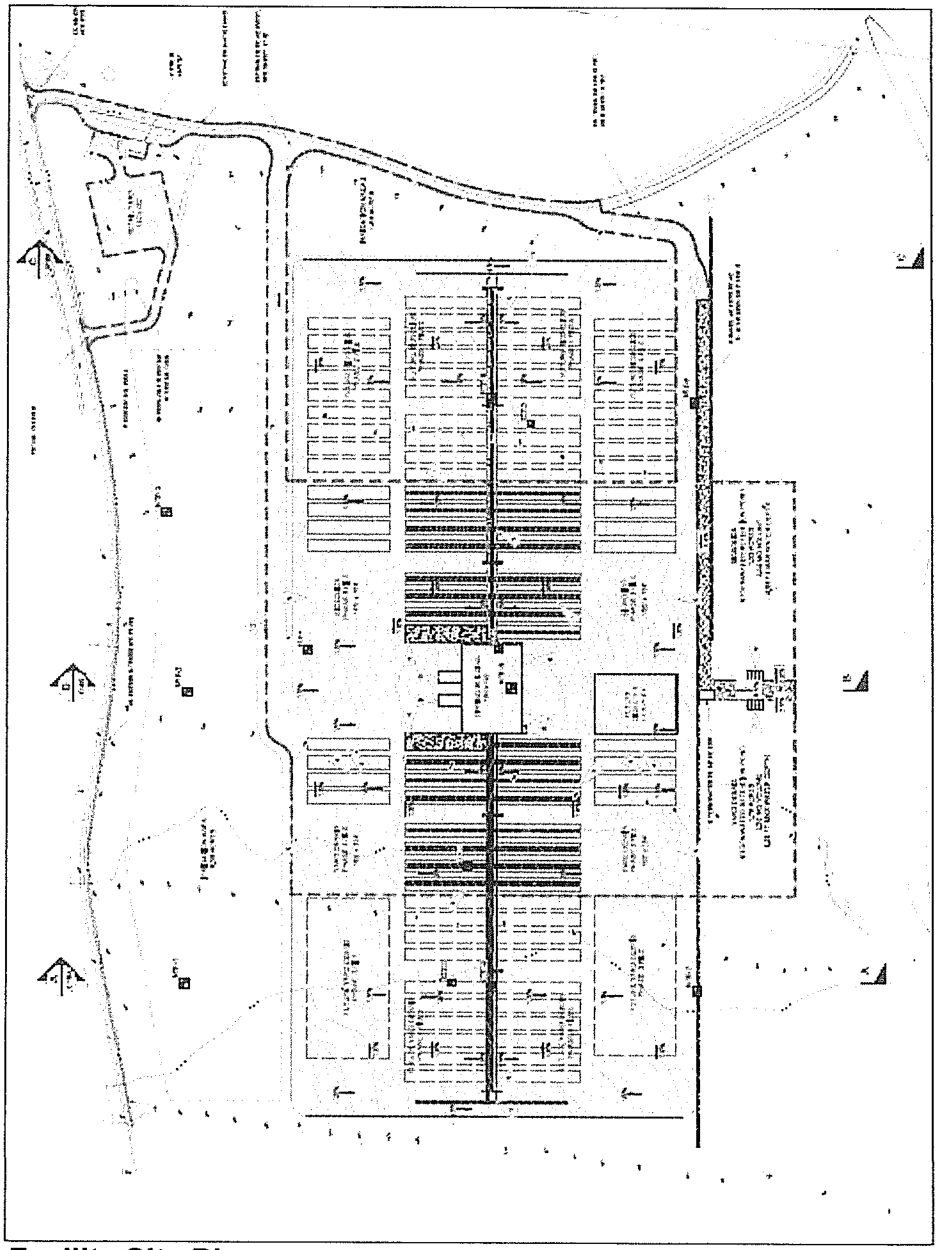

**Figure 2 - Facility Site Plan**

# III. Sound Level Descriptors and Criteria

## A. Sound Level Descriptors

Sound is measured as sound level in units of decibels, dB. The human ear responds differently to sounds at different frequencies. This is demonstrated by the fact that we hear higher pitched sounds more easily than lower ones of the same magnitude. To compensate for the different "loudness" as perceived by humans, a standard weighting curve is applied to measured sound levels. The weighting curve represents the frequency response of the human ear and is labeled as dBA ("A" weighted decibels). The A-weighting curve is often used to measure environmental sound.

People normally experience sound levels between 30 and 90 dBA, depending on their activities. Locations near highways or urban arterials may be 70 dBA, whereas quiet rural areas may be 40 dBA.

Each 10 dB increase in sound level corresponds to a tenfold increase of sound energy, but is judged by a listener as only a doubling of loudness. The smallest changes in sound level considered just noticeable are about 2 to 3 dBA, and 5 dBA changes are clearly noticeable.

Sound levels from two or more sources are combined logarithmically, not by adding the levels arithmetically. When two levels are combined, the louder level predominates, and the combined level is the louder level plus 0 to 3 dBA. Some examples: 50 dBA combined with 50 dBA is 53 dBA; 50 dBA combined with 40 dBA results in 50.4 dBA, which is rounded off to 50 dBA since fractions of a dB are negligible from the point of view of perception of environmental noise.

When measuring noise that is fluctuating over time, several A-weighted sound level descriptors are used to characterize the sound. In this report, the following descriptors are used:

**Leq** **Equivalent sound level, Leq,** is the most commonly used descriptor for measuring fluctuating sound. The Leq is the level of constant sound that, over a given time period, contains the same amount of sound energy as the measured fluctuating sound.

**Lmax** **Maximum sound level, Lmax,** is the highest instantaneous sound level for a given sound source, event, or time period. Because the Lmax in a neighborhood will,. Unlike Leq, typically have large fluctuations from hour to hour and day to day, Lmax is seldom used to measure noise impact, except in cases where brief high-level sound is causing an impact such as sleep disturbances.

**Lmin** **Minimum sound level, Lmin,** is the lowest sound level for a given sound source, event, or time period and is usually the relatively steady level of sound that is present in the absence of local noise events.

## B. Kittitas County Noise Code

Kittitas County sets forth a maximum noise level for noise measured at a residential lot line to prevent 'Public Nuisance' in section 17.44.150 of the Kittitas County Municipal Code. This code section stipulates that measured sound levels should not exceed "*50 decibels between the hours of 10:00pm and 6:00am, and 70 decibels at other hours*".

## C. Washington State Noise Criteria

Kittitas County is in Washington State. Because WAC noise limits are more stringent than Kittitas County noise code, the WAC limits are used for the purposes of this project. This provides a more conservative approach for noise mitigation.

The applicable noise ordinance as outlined in WAC 173-63-040 *Maximum permissible environmental noise levels* is based on the Environmental Designation for Noise Abatement (EDNA) for the source and receiving properties. WAC 173-60 defines the EDNA by land use. The maximum permissible environmental noise levels per Washington code are listed below in Table 1.

**Table 1: Maximum permissible environmental noise levels**

| EDNA of Sound Source | EDNA of Receiving Property | | |
|---|---|---|---|
| | **EDNA A** **Residential** **(dB(A)) (Leq)** | **EDNA B** **Commercial** **(dB(A)) (Leq)** | **EDNA C** **Industrial** **(dB(A)) (Leq)** |
| **EDNA A Residential** | 55 / 45 | 57 | 60 |
| **EDNA B Commercial** | 57 / 47 | 60 | 65 |
| **EDNA C Industrial** | 60 / 50 | 65 | 70 |

WAC Code 173-60-040(B) states that between the hours of ten (10:00) p.m. and seven (7:00) a.m. the limits given by the table above are reduced by ten (10) dB(A) for receiving properties within Class A EDNAs.

In addition, during any hour of the day or night the applicable noise limitations may be exceeded for any receiving property by no more than:

(a) 5 dB(A) for a total of 15 minutes in any one-hour period; or
(b) 10 dB(A) for a total of 5 minutes in any one-hour period; or
(c) 15 dB(A) for a total of 1.5 minutes in any one-hour period.

Based on land-use, the PacifiClean facility is categorized as EDNA-C, and the residential land use surrounding the site is categorized as EDNA-A. Therefore, the applicable daytime noise limit according to Washington Administrative Code is 60 dBA, and the nighttime limit is 50 dBA.

The noise limits apply to all processing, loading, and maintenance equipment operating at the proposed PacifiClean site, as well as trucks and other machinery traveling on site. These limits do not apply to trucks operating on public roads, which are regulated by noise emission criteria for individual vehicles. Emergency or warning beepers are exempt from the noise regulations.

## D. U.S. Environmental Protection Agency (EPA) Region X Noise Criteria

The EPA established non-statutory guidelines for evaluating noise increases caused by a project over existing sound levels. Noise increases of 0-5 dBA at residential receivers are considered a slight impact, 5-10 dBA a significant impact, and over 10 dBA a serious impact. These criteria are guidelines only, and have no statutory authority.

# IV. Existing Conditions

The proposed PacifiClean site is currently inactive. The principal existing sources of noise in the vicinity of the site are traffic on Interstate 90 and Thorp Prairie Road, other distant traffic noise, aircraft fly-overs and occasional activity associated with agricultural and residential activities nearby.

Existing sound levels were monitored continuously for three to four days at four locations representative of the PacifClean property boundaries from 6 September to 11 September, 2012. In addition, ambient noise levels were measured at a location representative of the nearest residence to the east of the PacifiClean property from 22 November to 24 November, 2012. All long term sound level measurements were made using Larson-Davis type 820 Environmental Noise Monitors which conform to ANSI standard S1.4 for a type 1 instrument. The locations of each of these measurements are given in Figure 3.

Results of the long-term measurements are shown in Figure 4 through Figure 8 as plots of the hourly Leq, Lmin and Lmax. The weather conditions for part of these measurement intervals included low levels of wind and minimal precipitation.

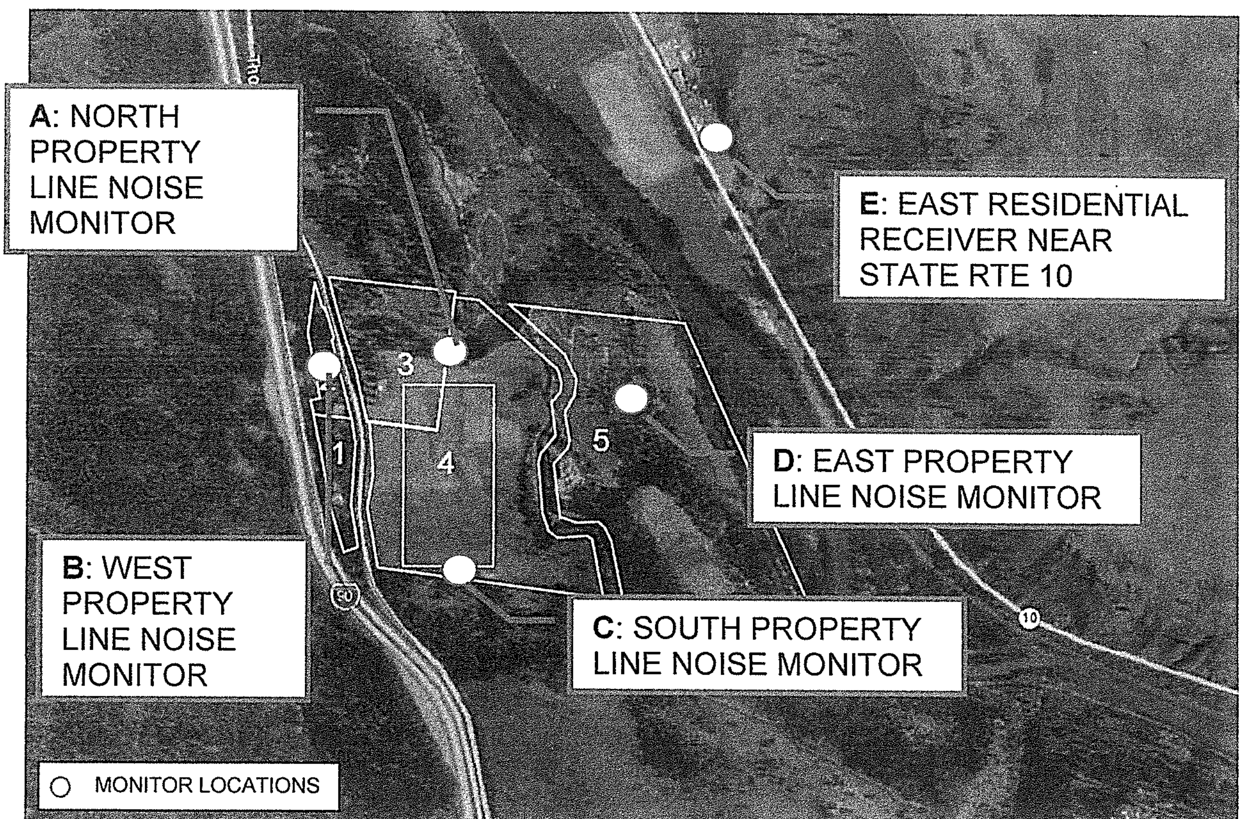


**Figure 3 – Long-term Noise Monitoring Locations**

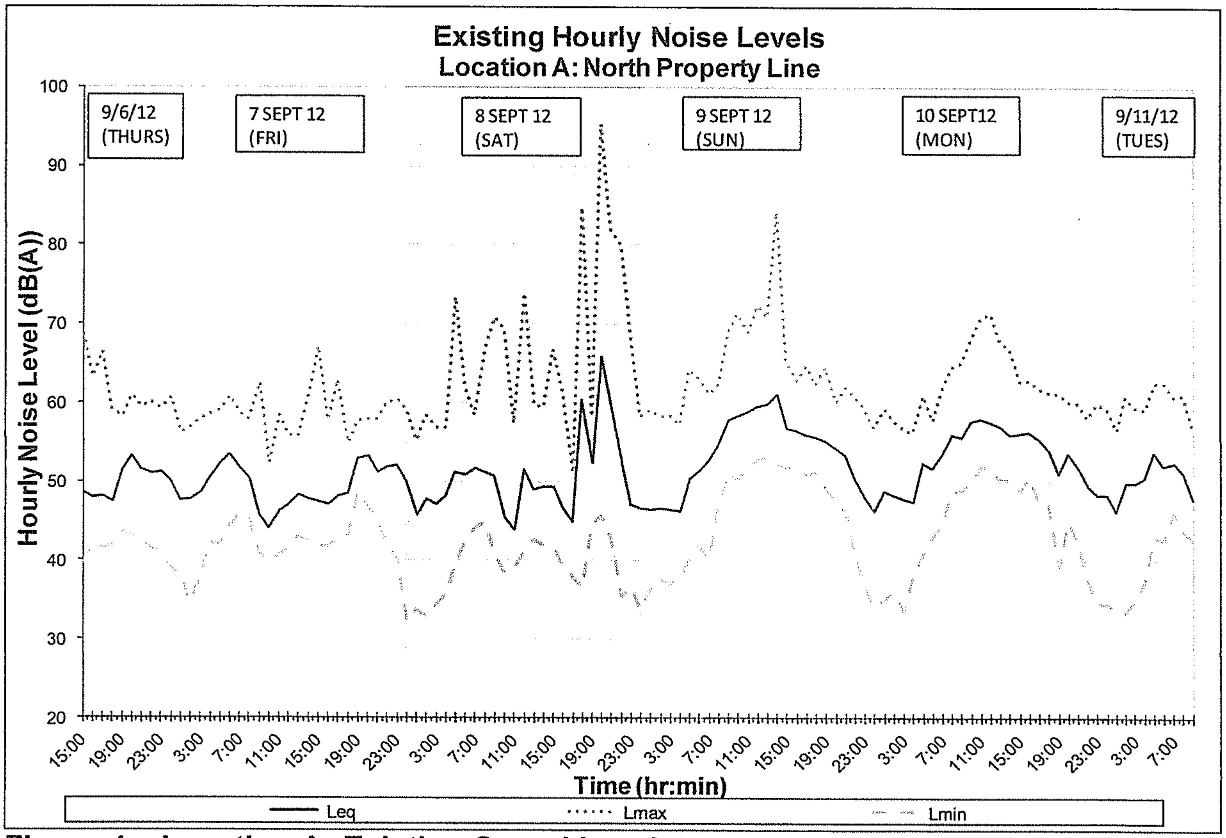


**Figure 4 – Location A: Existing Sound Levels**

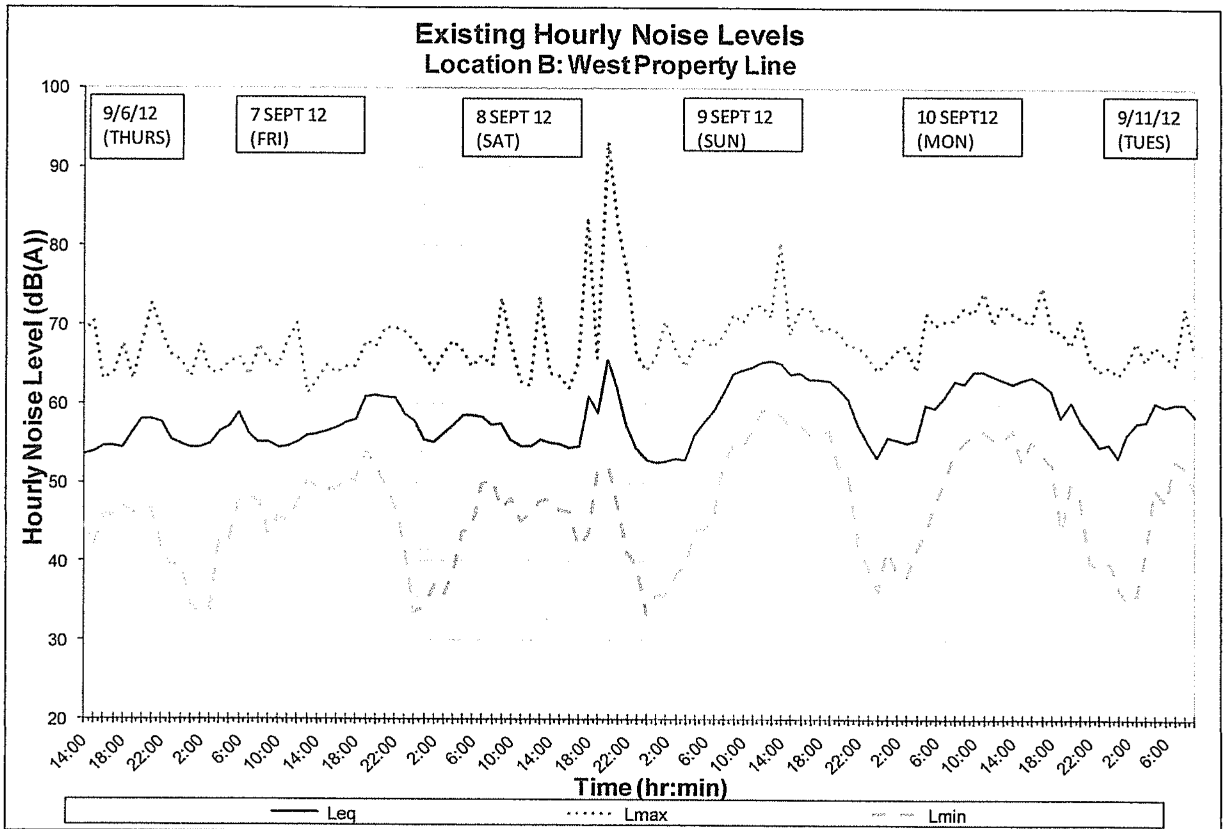


**Figure 5 – Location B: Existing Sound Levels**

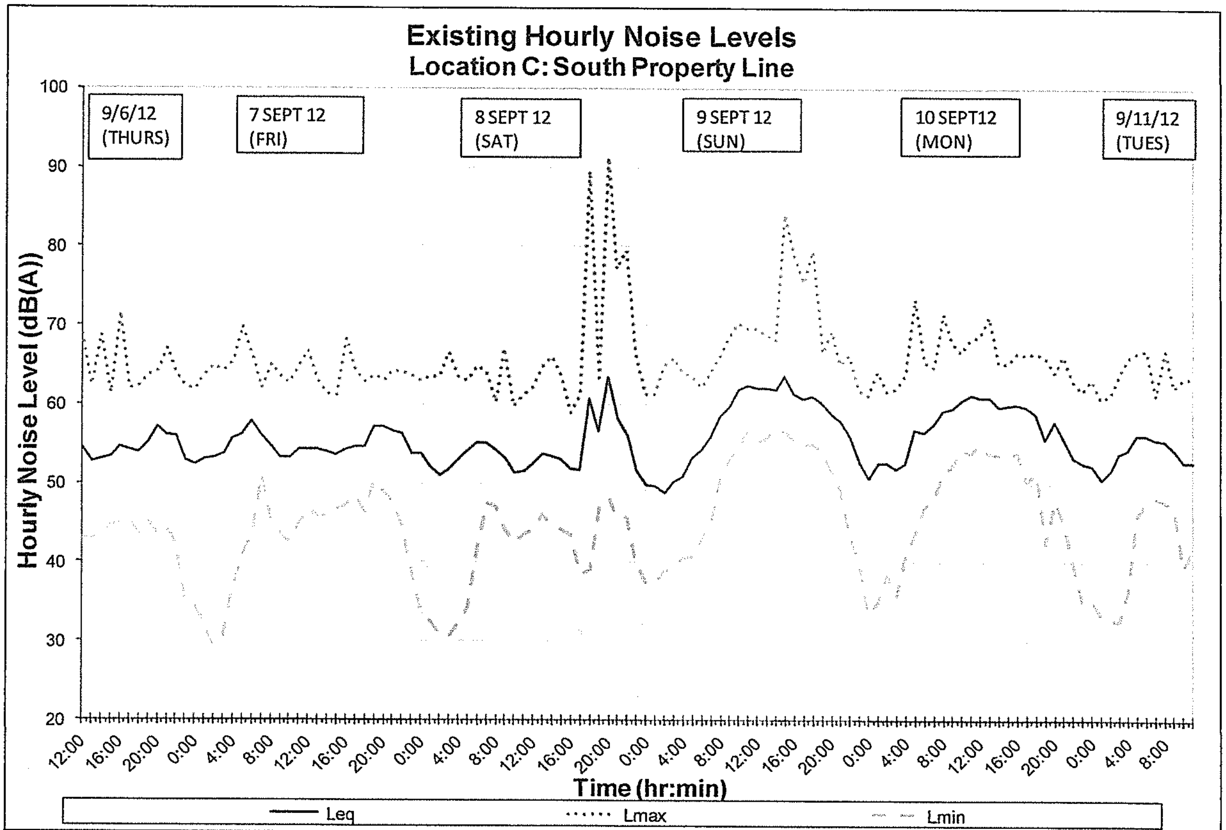


**Figure 6 – Location C: Existing Sound Levels**

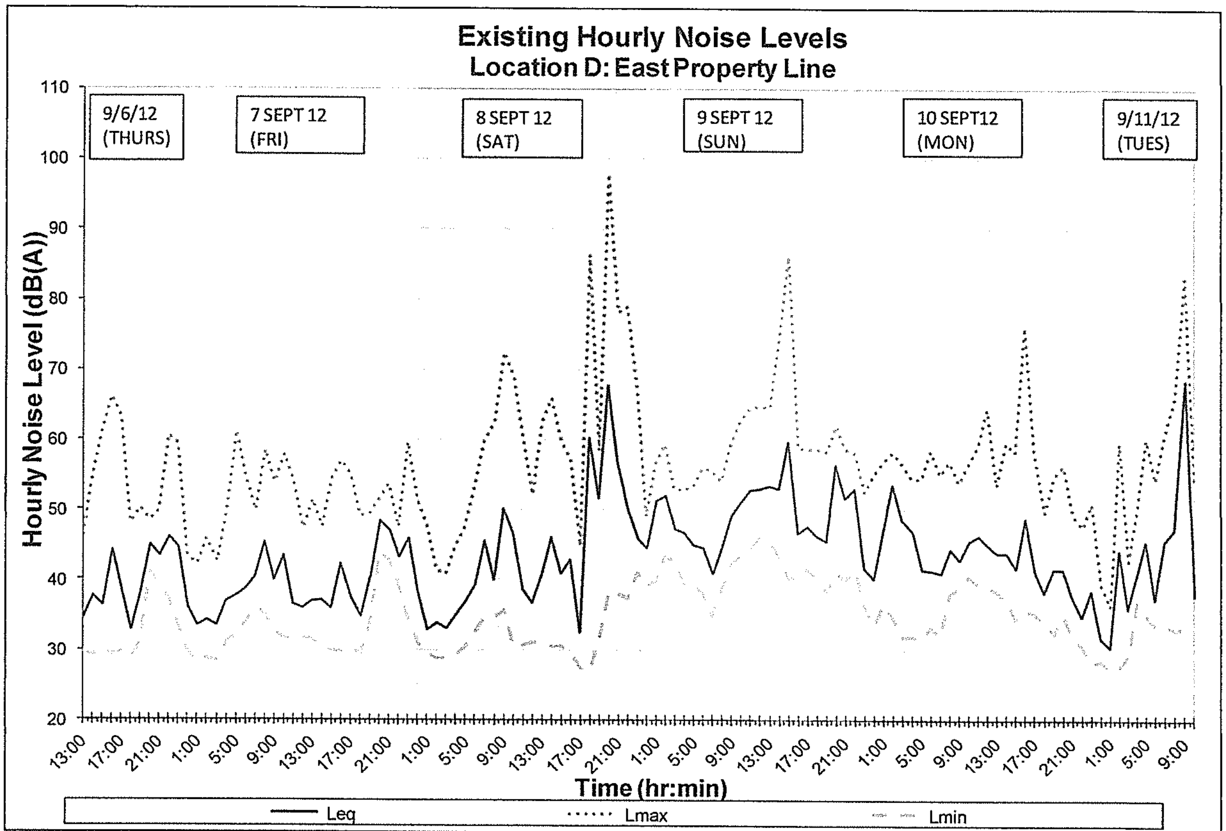


**Figure 7 – Location D: Existing Sound Levels**

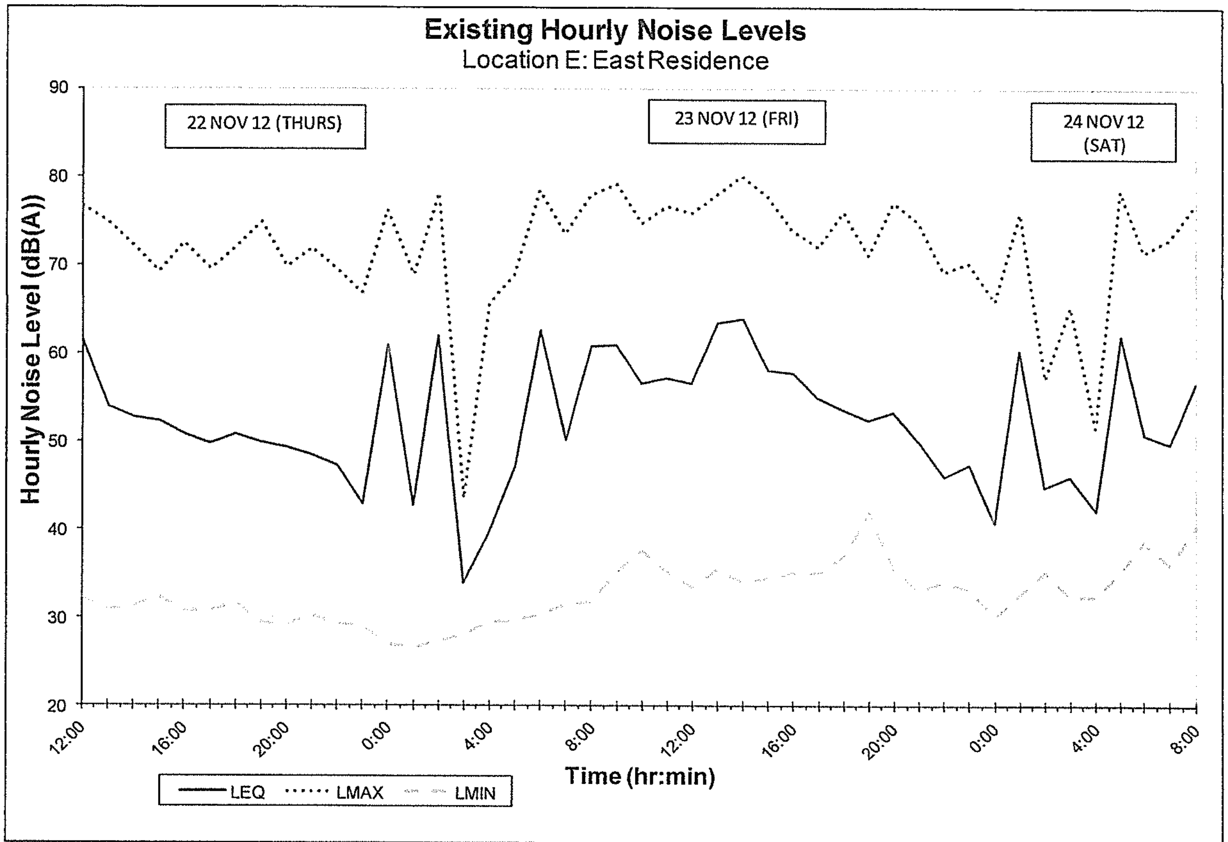


**Figure 8 –Location E - East Residence Existing Sound Levels**

In addition to an analysis of the PacifiClean facility noise impact at the property line, our analysis includes a prediction of the impact on the nearest existing residences to the north, west, east and south. A summary of the receiver locations used for analysis are provided in Table 2 and shown in Figure 9.

**Table 2 - Sound Analysis Receiver Locations**

| Receiver Number | Description |
|---|---|
| PL1 | North Property Line, approx 750 feet from main site |
| PL2 | West Property Line, approx 900 feet from main site |
| PL3 | South Property Line, approx 40 feet from main site |
| PL4 | East Property Line, approx 2100 feet from main site |
| R1 | Existing Residential Receiver, approx 3200 feet from site. Near Route 10 and active railroad |
| R2 | Closest Existing Residential Receiver to the west, approx 1200 feet from main site |
| R3 | Closest Existing Residential Receiver to the south, approx 3200 feet from main site. Near I-90 Elk Heights Exit |

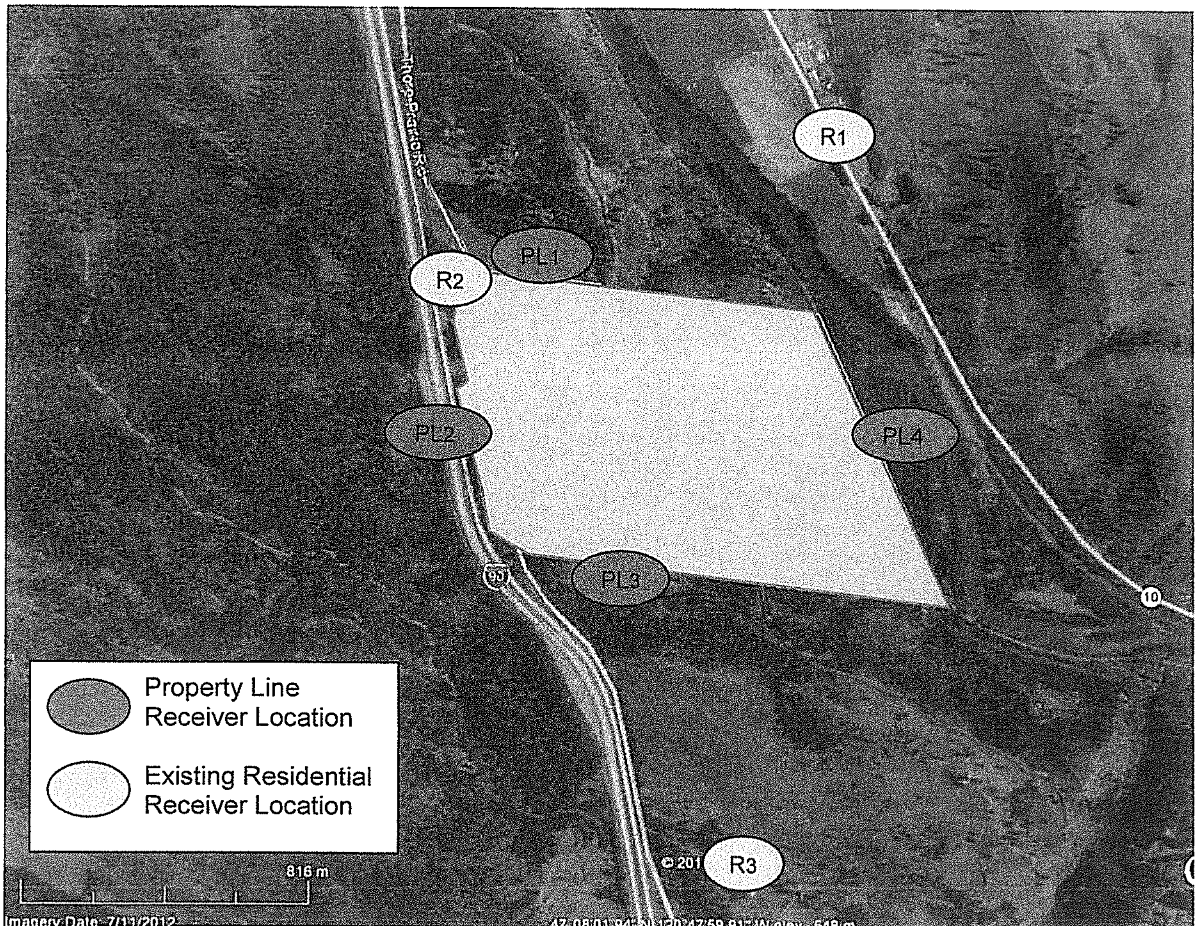


**Figure 9 – Receiver Locations used for Analysis**

Table 3 summarizes the ranges of existing sound levels at the noise analysis locations, based on the results of the long term measurements described above. The sound levels shown in Table 3 are considered the baseline ambient sound levels for evaluation of noise increases associated with the proposed PacifiClean Facility.

**Table 3 - Summary of Existing Sound Levels, dBA**

| Design Limit Description | | Receiver Location | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | PL1 | PL2 | PL3 | PL4 | R1 | R2 | R3 |
| Baseline Leq | Daytime | 44-66 | 54-66 | 51-64 | 33-68 | 49-64 | 54-66 | 51-64 |
| | Nighttime | 46-54 | 53-61 | 49-58 | 31-54 | 34-63 | 53-61 | 49-58 |
| WAC Noise Code Limit | Daytime | 60 | 60 | 60 | 60 | 60 | 60 | 60 |
| | Nighttime | 50 | 50 | 50 | 50 | 50 | 50 | 50 |

# V. Analysis and Discussion

## A. Proposed Equipment Operation and Noise Emissions

A schematic site plan of the proposed PacifiClean Facility is shown in Figure 2. The site will include an ingress / egress route for trucks delivering and removing material. Truck will enter the site in the northwest corner and proceed east to one of the two access roads. A retail yard and weigh station are located in the northwest corner as well.

A tipping building will be constructed which will be 35 ft – 40 ft high. Dimensions of the building will be 180 ft X 120 ft. Delivery of feedstock's, shredding, mixing and grinding of high nitrogen feedstocks will take place in the building. The tipping building will be constructed with a concrete wall base at least 10 ft high with metal roll-up doors typically closed. During delivery of material there will be short periods when the doors are open during grinding, mixing, and loader operation.

The following equipment will operate inside the tipping building:

- An electric horizontal grinder in the 400 - 500 HP range
- An auger mixer of approximately 75 Hp
- One excavator in the 150 – 200 HP range
- One loader in the 300 – 400 HP range

In the general outdoor area of the 38 acre site the following equipment will operate at various times:

- Two loaders in the 300 – 400 HP range
- An electric powered Trommel screen in the 150 - 200 Hp range
- Blowers used to evacuate the tipping building, either 2 or 4 blowers with a total Hp of approximately 100.
- A 1000 HP diesel grinder for solid wood residuals or use in emergencies

The processes to take place on the site will include feedstock blending, separating, mixing, screening, grinding, shredding, then composting and curing. The site will store product then serve as a distribution yard for compost and compost products.

Gore Cover Technology(TM) will be used during the initial phase of composting. The Gore technology employs the Aerated Static Pile (ASP) method of composting wherein airflow is induced under positive pressure through the compost pile to maintain aerobic conditions throughout the first 28-days of composting. Maintaining aerobic conditions optimizes the biology of the system, expedites the composting process and reduces the generation of objectionable odors.

The ASP method is conducted by constructing a pile (also referred to as a heap) then leaving the pile for 28 days. Loader activity to build each pile will take approximately 3 hours. During the 3 hours the activity of the outside loader will be intermittent as the loader will move from the conveyor belt drop point to the pile. After pile construction the loader will not move material for 28 days.

Each of the two outside loaders will operate independent of each other. One operating on the biosolids side of the site and one on the non-biosolids side of the site, which are at opposite ends. After the initial 28 days of composting the product will be moved to a pile for an additional 15 days then moved to storage. After storage, product screening will take place with the electric Trommel screen.

The 1000 Hp diesel grinder will be used for seasonal and storm debris grinding infrequently as needed. The use of this equipment will be restricted to the central area of the site and coordinated with the operation of other equipment to avoid excessive noise to neighboring properties. This unit will be used to supplement typical grinding within the tipping building, and in the case that the electric grinder within the Tipping Building shuts down for repair, the Diesel Grinder may be brought into the Tipping Building for a short period of time as a replacement.

Sound levels for the proposed equipment were provided by the equipment manufacturers. The source sound levels normalized to a reference distance of 30 feet are shown in Table 4. Our understanding is that, at this time, this represents the extent of the major noise producing equipment.

**Table 4 - Reference Sound Levels of Equipment**

| **Source** | **A-Weighted Leq at 30 Feet** |
|---|---|
| Phoenix 3300 Electric Trommel Screen | 44 |
| Diamond Z 7000 Diesel Grinder | 87 |
| Rotomix Auger Mixer* | 47 |
| Diamond Z Electric Grinder** | 77 |
| Blower Motors | 47 |
| Volvo L220G Loader | 82 |
| Volvo EC220D Excavator | 75 |

* Radiated sound data for 75 HP motor provided
** Sound Data not yet available from Diamond Z for Electric Grinders. Field tested sound levels used for Peterson Electric Horizontal Grinder, comparably sized.

Warning devices such as back-up alarms are exempt from noise regulations.

A back-up generator will be installed to the north of the tipping building. Generator operations during emergencies are exempt from noise regulations. Potential noise impacts from regularly scheduled testing of the generator will be addressed at a later date, after the manufacturer, model, and load rating of the generator are selected.

We understand that the equipment is desired to move about the main yard as shown in the figure below. Worst case scenarios of all possible equipment located as close to the receiver locations as possible were used for calculation.

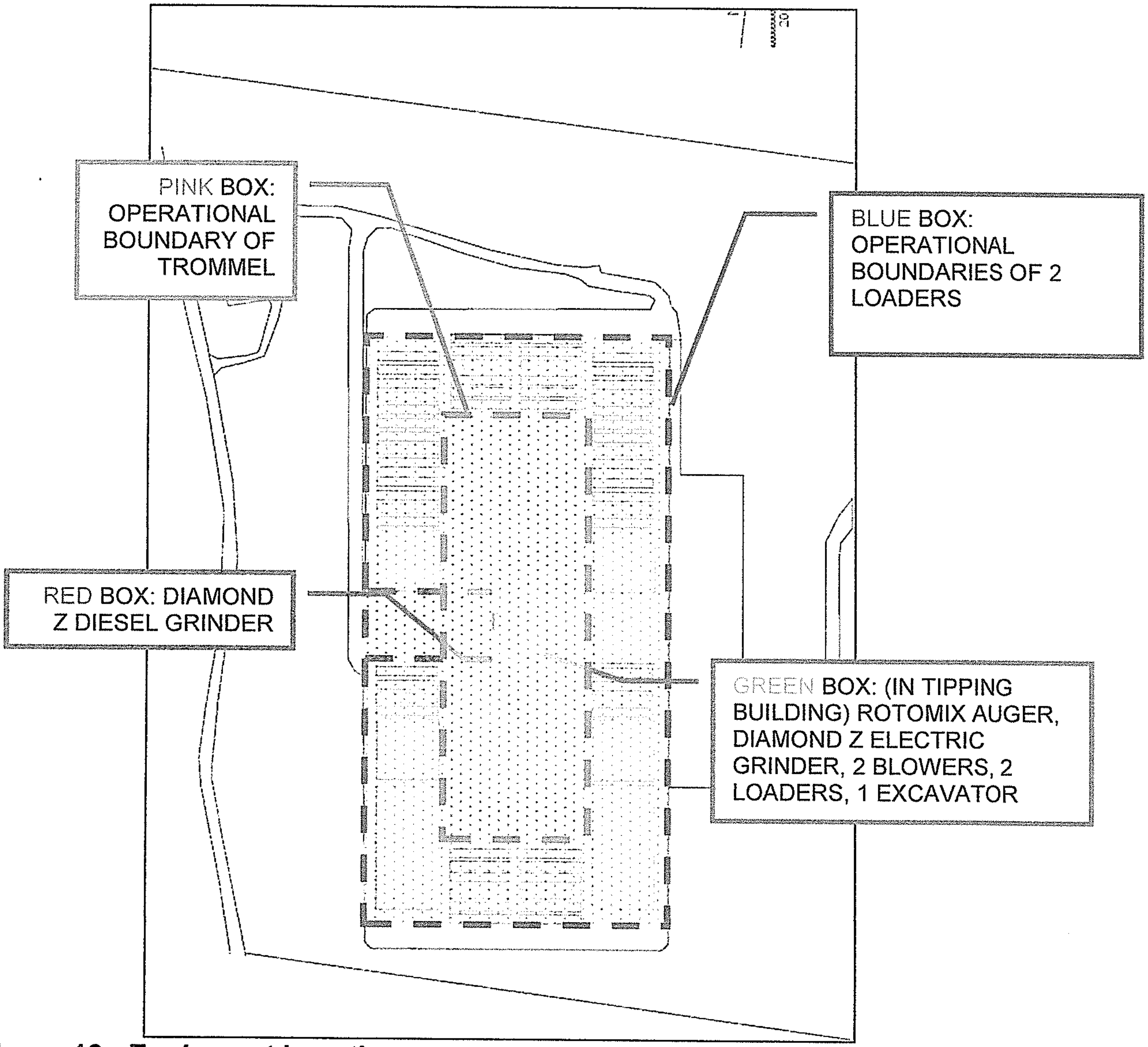


**Figure 10 - Equipment Locations**

## B. Predicted Equipment Sound Levels

Predictions of sound levels produced by facility operations were calculated for the 7 receiver locations noted above. These predictions were conducted for the first-story elevation of 5 feet off the ground.

The calculations take into account source reference sound levels, source and receiver locations, attenuation due to distance, and amount of time operating at a given position within an hour. The predictions take into account that all equipment operating within the Tipping Building only operates when the building roll-up doors are closed. They also incorporate attenuation due to the Tipping Building construction of concrete walls, a ceiling, and metal roll up doors with smoke seals.

For the purposes of the calculations, two scenarios were considered: a day time and night time scenario. The day time scenario runs from 7AM to 10PM, and the night time scenario from 10PM to 7AM. This corresponds to the daytime / nighttime code limitations imposed by the WAC, as outlined above. A description of each scenario follows, summarizing the operational assumptions for facility equipment. The results of these scenarios are presented in Table 5 and Table 6. Note that these results are for all equipment operating at the closest point of the main site to each receiver so as to create a worst case scenario for noise transmission at each noise analysis location.

Scenario 1: Daytime operation.

As a worst case, the equipment will be operating on the nearest boundary to the receiving property as given in Figure 10. Activity from one loader would be anticipated with work from the Trommel screen; the other loader would be operating on the other half of the site. Equipment within the tipping building will be running continuously, as will the blowers. The diesel grinder will be operated within the area shown in front of the tipping building, during times when the Trommel and loaders are operating on the north half of the site. Loaders will operate no closer to the site perimeter than the edge of the piles. During this activity, the loader would be transferring material to the Trommel elsewhere on site, and spending only 25% of the time working near the piles.

Scenario 2: Night time operation.

At night, the only activity anticipated on site would be grinding associated with the electric grinder in the tipping building, and the blowers. All other outdoor activity would not occur.

## 1. Property Line Noise Predictions

As there are no existing receivers located immediately on adjacent properly lines, predicted noise levels from equipment on the PacifiClean site are compared to WAC noise limits. Based on the operational limits outlined in the day time and night time scenarios above, Washington Administrative Code limits will be met at the property boundaries of the PacifiClean site, as shown in Table 5, below.

**Table 5 - Predicted Noise Levels at Adjacent Property Lines**

| Description of Operations | Predicted Worst-case Sound Levels due to Facility Operation at Receiver Locations (Leq, dBA) | | | |
|---|---|---|---|---|
| | PL1 | PL2 | PL3 | PL4 |
| **Scenario 1** (Day time) | 54 | 57 | 59 | 51 |
| **Scenario 2** (Night time) | 37 | 33 | 42 | 33 |
| **WAC Noise Limit** | | | | |
| Day time | 60 | 60 | 60 | 60 |
| Night time | 50 | 50 | 50 | 50 |

## 2. Predicted Noise Levels to Nearest Residences

At the nearest residences to the site (receivers R1, R2 and R3) we have compared the predicted noise levels to the existing ambient noise levels. This indicates no impact per the EPA non-statutory guidelines for the quietest hours measured for the residences. The results of this evaluation are given in Table 6, below.

**Table 6 - Predicted Noise Levels at Nearest Residential Receivers**

| Description of Operations | Predicted Worst-case Sound Levels due to Facility Operation at Receiver Locations (Leq, dBA) | | |
|---|---|---|---|
| | R1 | R2 | R3 |
| **Scenario 1** (Day time) | 47 | 47 | 49 |
| **Scenario 2** (Night time) | 29 | 28 | 35 |
| **Existing Ambient Noise Levels** | | | |
| Day time | 49-64 | 54-66 | 51-64 |
| Night time | 34-63 | 53-61 | 49-58 |

At the nearest receiving locations to truck traffic on site (receivers PL1, PL2 and R2), predicted noise levels due to truck traffic during daytime and nighttime hours are below both the code limits, and the existing ambient levels.

At the locations examined for Truck traffic, the predicted levels are added to noise produced by site equipment for a total predicted noise level. The total predicted noise level for PL1, PL2 and R2 are given in Table 8.

**Table 8 – Total Predicted Noise Levels including Truck Traffic**

| Description of Operations | Total Predicted Sound Levels at North and West Receiver Locations (Leq, dBA) | | |
|---|---|---|---|
| | PL1 | PL2 | R2 |
| Scenario 1 + Truck Traffic | 55 | 58 | 48 |
| Scenario 2 + Truck Traffic | 42 | 39 | 38 |
| **Design Goal** | **WAC** | | **Existing Ambient Noise Levels** |
| Day time | 60 | 60 | 54-66 |
| Night time | 50 | 50 | 53-61 |

As can be seen from the table above, the total predicted noise level meets code requirements at PL1 and PL2, and has no impact on existing ambient noise levels at R2.

## D. Noise Mitigation Recommendations

Predicted noise levels shown above take into account operational assumptions as outlined above. These include:

Daytime operations:

- The Diamond Z Diesel grinder will not operate while there is Trommel and loader activity in the south half of the site.
- Equipment will be operating within the site boundaries outlined in Figure 10.
- Both outdoor loaders will not operate within the same area of the facility at the same time.
- One loader will serve to distribute material from the Trommel, and will spend over 25% of its time in operation depositing material on the piles, 50% in transit, and 25% receiving material at the Trommel.

All daytime activity will be conducted to achieve the 60 dBA Leq noise limit at the property boundaries for PacifiClean equipment during day time hours. Changes in the operational requirement or equipment selections of the PacifiClean site will be reviewed for compliance with this limit.

Night time operations:

- The only equipment in operation will be the electric grinder within the tipping building, and the blowers.

All activity by PacifiClean equipment will be restricted so as to achieve the 50 dBA Leq noise limit at the property boundaries during night time hours. Changes in the operational requirement or equipment selections of the PacifiClean site will be reviewed for compliance with this limit.

# VI. Summary

Based on manufacturer-provided noise levels for the anticipated equipment on site, and operational assumptions of the equipment, we have predicted the worst-case environmental noise impact to the neighboring property lines of the PacifiClean site, as well as to the nearest existing residential properties. These predictions indicate compliance with the Washington Administrative Code requirements at the property line, and no impact on existing noise levels at the closest residential receivers per EPA guidelines. We have also analyzed truck traffic on site, which is predicted to be below code limits and existing ambient levels. These predictions take into account the noise mitigation assumptions shown above.

Should you have any questions or concerns regarding the above, please don't hesitate to contact us.

Sincerely,
SSA Acoustics, LLP

**Mohamed Ait Allaoua**
MANAGING PARTNER &
SENIOR ACOUSTICAL CONSULTANT

**Matt Roe**
ACOUSTICAL CONSULTANT